Session 403

Broadcasting Live With QuickTime Streaming and MPEG-4

QuickTime Engineering—Team Lemur

Introduction

- QuickTime Streaming
- New Broadcast APIs
- Developments in MPEG

What You'll Learn

- How QuickTime Streaming is structured
- How to write a Broadcast Application
  - Live, Stored, Custom
- Status of MPEG-4 and QuickTime

QuickTime Movies on the Internet

- QuickTime 3
  - Fast-Start
- QuickTime 4
  - Streaming
- QuickTime 5
  - Broadcast APIs

What Is Fast-Start?

- HTTP download of movie
- Can play before entire movie is downloaded
- Stored movies only
- Movie is on your disk
- Good for movies bigger than your bandwidth
- Can host on any HTTP 1.0 server

What Is QT Streaming?

- Uses RTSP/RTP
- Data arrives in real-time
- Can lose packets
- Player can't save the movie
- Must host from a streaming server (Apple QTSS, Cisco IPTV, RealServer 8)
- Two kinds of streaming in QT:
  - Stored content (video on demand)
  - Live content (concert, keynote)

Broadcast APIs

- Allow third-parties to easily author broadcasting applications
- Basic functionality with very few calls
- Advanced functionality available

Unicast vs. Multicast

- Unicast
  - Separate stream for every client (3 clients, 3 streams)
  - Bandwidth is cumulative
- Multicast
  - One stream for all clients
  - Bandwidth stays constant regardless of number of clients (3 clients, 1 stream)
  - Must be supported by network hardware

TCP vs. UDP

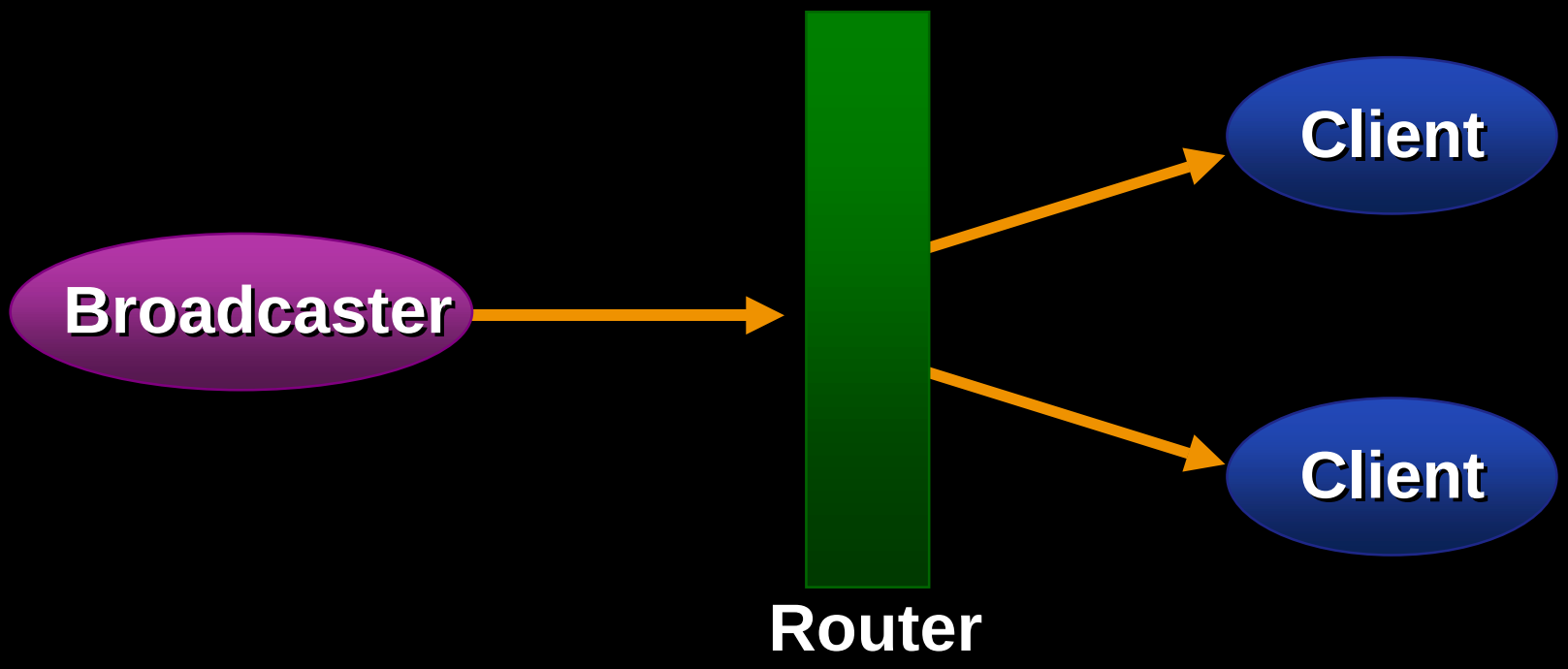
- TCP
  - Packets guaranteed to arrive
  - Packet can take a long time to arrive
- UDP
  - Packets arrive on time
  - Packets can get lost

Streaming Connection Types

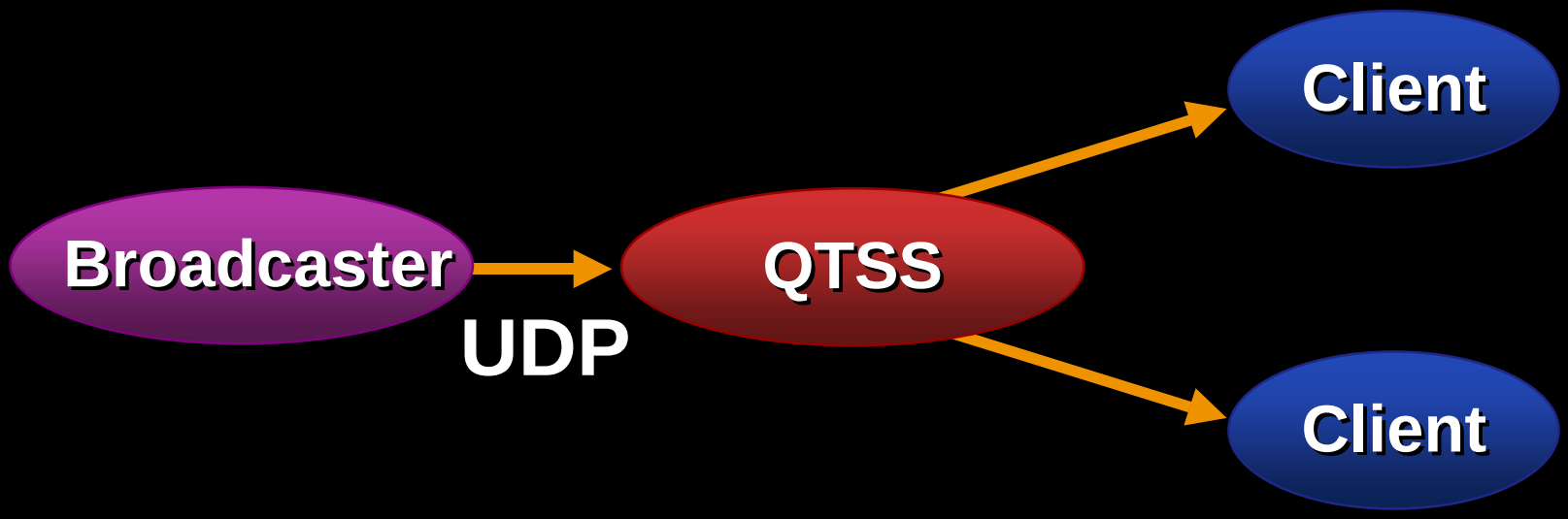
- Video on Demand
  - Unicast through server
- Live Broadcast
  - Unicast
  - Multicast
  - Reflected through server
  - Reliable (new in QT 5!)

Unicast Broadcast

Multicast Broadcast

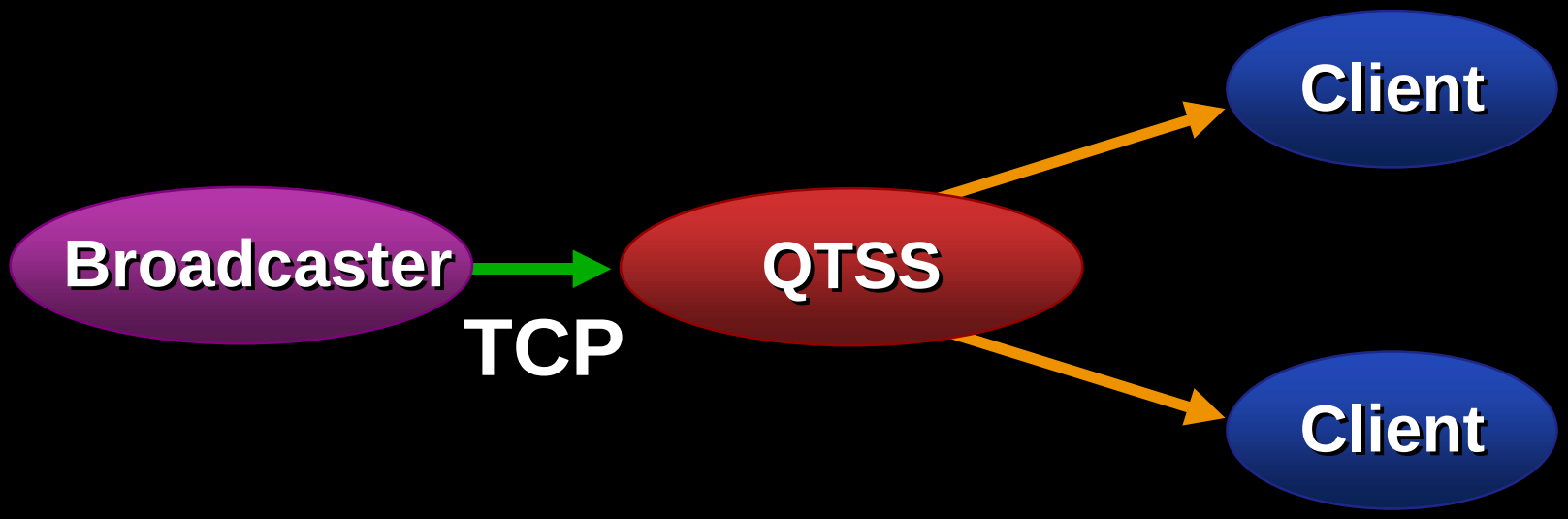


Reflected Broadcast



Reliable Broadcast

New in QuickTime 5



Info Needed to Broadcast

- Connection info: IP address/port or URL
- Number and type of streams: video, audio, text
- Source of data: video camera, stored movie, etc.
- Data Formats
  - SDP (RFC 2327)
    - IETF standard
  - XML
    - W3C syntax
    - QuickTime preferred

Demo

Broadcast APIs

What have they done for you lately?

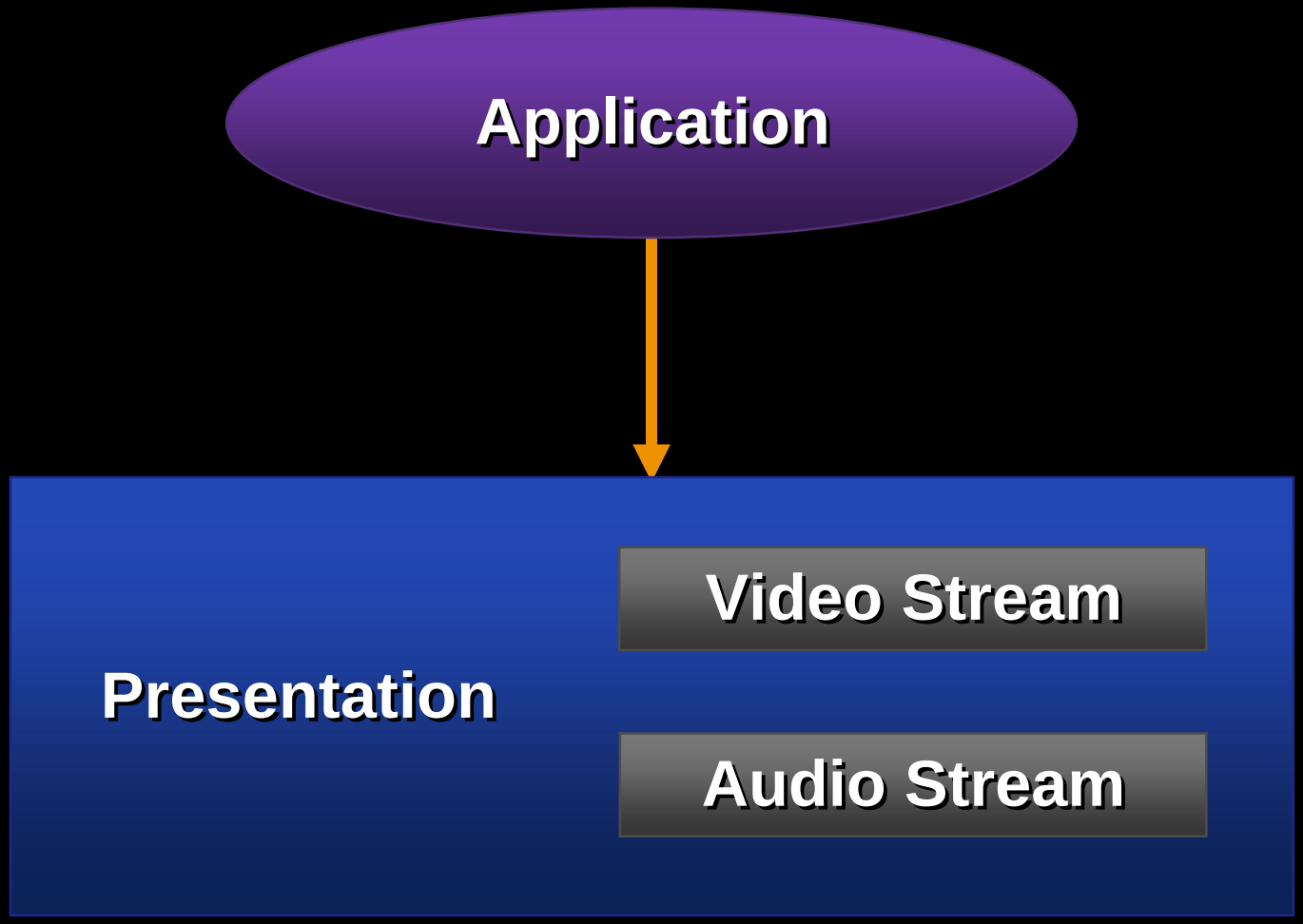
- Send audio, video, and text streams
- Send media from capture devices, stored movies, and other app source
- Send standard RTSP/RTP streams
- Streams viewable by QT 4.0 and beyond

Writing a Broadcaster

You and QTSPresentation, Makin' Friends

- QuickTime will:
  - Make a connection
  - Send packets
  - Implement protocols (RTSP/RTP)
- Your Application will:
  - Provide UI
  - Set up the broadcast

What the Heck Is a Presentation?



How to Create a Presentation

- Call and configure QTSNewPresentationFromFile
  - Connection information
  - Sourcer information
  - Media configuration (codec/packetizer)

App Interactions

- QTSPresIdle
  - Mac OS X: Use CarbonEventLoopTimer or CFRunLoop
- Notification proc

Starting a Broadcast

- QTSPresPreroll
- Wait for kQTSPresPrerollAck
- Call QTSPresStart after the Ack

Sourcer Components

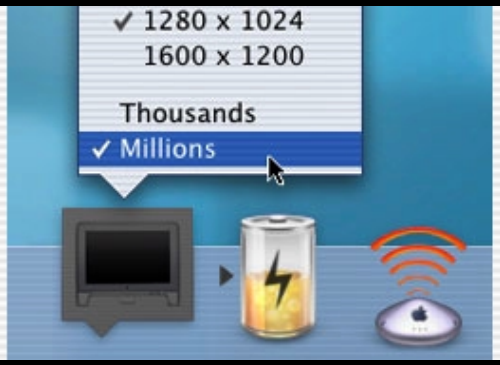
- Provide media samples
- Generate a SampleDescription and timestamp
- Sourcers in QT 5
  - Sequence Grabber sourcer
  - Track sourcer
  - PushData sourcer

Demo

Information

- Seeding and Feedback:
  qtswfeedback@apple.com
- Sample Code:
  http://developer.apple.com/samplecode/Sample_Code/QuickTime.htm
- Documentation:
  http://developer.apple.com/techpubs/quicktime/quicktime.html

MPEG-4



Overview

- Standards and QuickTime
- MPEG Family
- MPEG-4

Standards and QuickTime

- Video: MPEG-1, MPEG-2, H.261, H.263, DV, JPEG, M-JPEG, PNG, TIFF-Fax, …
- Audio: MPEG-1/MP3, MPEG-2, μLAW, aLAW, au, IMA, GSM, …
- Streaming: RTP, RTSP, SDP
- File Format: MOV, AIFF, DV-stream, MPEG-4, …

Meet the MPEG Family

- MPEG-1, MPEG-2, MPEG-4
- Target applications
- Technologies involved
  - Systems
  - Video
  - Audio

MPEG-1 Applications

MPEG-1

Enterprise Streaming

Video CDs

MP3 Audio

MPEG-2 Applications

MPEG-2

Broadcasting

DVD/Home Theater

MPEG-1

Enterprise Streaming

Video CDs

MP3 Audio

MPEG-4 Applications

MPEG-4
Internet Streaming
Consumer Electronics
Wireless Multimedia
Hand Held Devices
Media Databases

MPEG-2
Broadcasting
DVD/Home Theater

MPEG-1
Enterprise Streaming
Video CDs
MP3 Audio

MPEG-1 Technologies

Synchronization

Audio

2 channels @ 32–256 kbps per ch

Video

352 x 288 @ 500–1200 Kbps

Demo

MPEG-2 Technologies

Synchronization

Audio
5.1 channels
AAC

Video
720 x 480 @ 4–15 Mbps
Scalable
Interlaced video

Data Transport

Demo

MPEG-1 Technologies

Synchronization

Audio

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MPEG-2 Technologies

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Data Transport

MPEG-4 Technologies

Scene Description

Interactivity

Synchronization

MPEG - J
(Java)

Audio
General
Speech
Synthetic Speech
Synthetic Audio

Visual
Video
Still Images
Text
2D Graphic
3D Graphic
Face and Body Animation

Intellectual Property Management and Protection

File Format (QuickTime)

Data Transport (Flexmux/Transmux)

MPEG-4 Conformance

- Profiles
  - Subsets of technologies targeted at specific solutions
- Levels
  - System constraints
    - Memory
    - Computational Complexity
    - Bandwidth

But Just for Visual…

10 profiles X 5 levels per profile

=

Lots of conformance points…

MPEG-4 Is Huge!

- Where do you start?

ISMA Wants You!

- Internet Streaming Media Alliance
  - Apple, Cisco, IBM, Kasenna, Philips, Sun, and others
- Interoperate on few subsets of MPEG-4, plus IETF streaming standards
- http://www.isma.tv

QuickTime's MPEG-4

- Visual
  - Frame-based video
- Audio
  - CELP, AAC
- System
  - RTP/RTSP/SDP Streaming
  - MP4 File Format

Demo

Summary

- MPEG-4 will be integrated into the QuickTime ecosystem
  - Create and play back MPEG-4 content
  - QuickTime-based tools and technologies can enhance MPEG-4 content

Roadmap

406 QuickTime & Darwin Streaming Server Overview	Civic **Thurs., 9:00am**
407 Customizing QuickTime & Darwin Streaming Server	Civic **Thurs., 10:30am**
FF109 Feedback Forum: QuickTime	Room J1 **Thurs., 3:30pm**

ANNOUNCING

QuickTime Live!

October 8–11, 2001
The Beverly Hilton Hotel
Beverly Hills, CA

Full day workshops, Conference Sessions,
QuickTime Product Showcase, Keynotes and Social Events with the community
of QuickTime Developers, Content Creators, and New Media Business Professionals.
Get Face-to-Face with the QuickTime team for a week of training, business
Opportunities and industry perspectives that you can't get anywhere else.

www.apple.com/quicktimelive

Develop. Produce. Deliver.

Information

- Seeding and Feedback:
  qtswfeedback@apple.com
- Sample Code:
  http://developer.apple.com/samplecode/SampleCode/QuickTime.htm
- Documentation:
  http://developer.apple.com/techpubs/quicktime/quicktime.html

WWDC

Worldwide Developers Conference 2001